REGARD Profibus-DP Gateway
User documentation

REGARD Profibus-DP Gateway
Part-Number: AG00485

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The REGARD Profibus-DP Gateway AG00353 is discontinued and succeeded by AG00485. This Gateway is downwards compatible to AG00353 !

In case of ordering a replacement Gateway of AG00353 you will get the latest Version AG00485.

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1. For your safety

The law for governing technical work equipment (equipment safety law) requires to point out the following points [1)]:

Strictly follow the Instructions for Use
Any use of the *REGARD Profibus-DP Gateway* requires full understanding and strict observation of these instructions. The *gateway* is only to be used for the purposes specified hereunder.

Maintenance
At regularly time intervals a function test must be performed by qualified personnel (with log). Only qualified personnel is permitted to make any modifications.

Use in hazadous areas
The *Regard Profibus-DP Gateway* is not designed or certified to be installed or to be operated in hazardous areas.

Liability for proper functioning or damage
The liability for the proper function of the *REGARD Profibus-DP Gateway* is irrevocably transferred to the owner or operator to the extent that the *gateway* is serviced or repaired by personnel not employed or authorized by DrägerService or if the *gateway* is used in a manner not conforming to its specified use.
Dräger Safety AG & Co. KGaA doesn´t take any liability for damages caused due to ignoration of the above mentioned advises.
The warranty and liability provisions of the terms of the sale and delivery of Dräger Safety AG & Co. KGaA are likewise not modified by the recommendations given above.

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[1)] All references to laws, regulations and standards apply to the legal system of the Federal Republic of Germany.

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2. Introduction

2.1. Intended Use

The *REGARD Profibus-DP Gateway* provides a Profibus-DP fieldbus coupling for the *REGARD Control-System* of *Dräger Safety AG & Co. KGaA* and enables the access to informations about the current status of alarms, faults, maintenance messages and critical failures as well as the current gas concentrations of all *REGARD channel cards* (e.g. 4.20mA-, SE-EX-, HART- cards....) for a *REGARD Control-System*.
In addition to that the *gateway* provides the possibility to acknowledge alarms and faults for a single or all cards as well as putting single or all cards into command mode to inhibit alarms.
For the proper operation of the *REGARD Profibus-DP Gateway* a *REGARD Master card* is necessary.

2.2. Description

As a base for the *REGARD Profibus-DP Gateway* the universal fieldbus *gateway* UNIGATE® of the company Deutschmann Automation GmbH was selected. In the standard version this *gateway* adapts a serial interface RS232/RS485 to the Profibus-DP according to the standard EN 50170. In this version the data are transferred transparenctly.

In order to consider the special protocol characteristics of the *REGARD Control-System* and at the same time to ensure a significant figure of the transferred information on the Profibus-DP field bus, the software of the *gateway* was redesigned by the manufacturer following the specifications of the *Dräger Safety AG & Co. KGaA*.

REGARD Control-Systems with up to 99 *REGARD channels* are supported by a *REGARD Profibus-DP Gateway* using the *REGARD Master card*.
The *REGARD Profibus-DP Gateway* operates only as a Slave on the internal serial *REGARD system bus* and even thus it can not read or send data direct to *REGARD channel cards*. This function is taken over by the *REGARD Master card* in a *REGARD Control-System*.

The *Master card* queries cyclically all *channel cards* for status (alarms, faults, maintenance messages and critical failures) and the current gas concentrations. For a *REGARD Control-System* the cycle time to query 99 *channnels* for status is approx. 2.2 sec. and approx. 10 sec. for the gas concentration

The *gateway* analyses all information about status and gas concentrations of the *channel cards* and stores the data accordingly sorted to the *channel card number* in a internal buffer. With each renewing query of the *Master card* the data already available in the buffer are updated.

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After every query cycle for the status of the *channel cards*, so after 2.2 sec, the *Master card* queries also the *gateway* for data (alarm acknowledge, command mode and alarm inhibit) for overtaking into the *REGARD Control-system*. If data is available, it will be overtaken by the *Master card* and passed on to the *channel card*, which will then execute the function.

On the Profibus-DP fieldbus the *REGARD Profibus-DP Gateway* behaves likewise only as a Slave. An attached standard-conformal Profibus-DP master, e.g. a PLC/DCS, can interrogate only information from one *channel card* at a time. In order to achieve this the Profibus-DP master has to transmit first a *channel card number* to the *gateway*. There upon the *gateway* places the requested information of the selected *channel card* from the buffer into the data output register and the Profibus-DP master can read in the data now by a query.

In addition to the data for status and gas concentration also the *channel card number* is supplied by the *gateway*. Thus the Profibus-DP master is put into the position to determine whether the information of the selected *channel* is already present (valid), or whether the *gateway* still provides information for a *channel* out of a query taken place before (data validation).

In order to enter the data of all *channels cards* in a *REGARD Control-System*, the attached Profibus-DP master must query all *channel cards* cyclically.

Up to 32 users, transmitter and receiver, can be summarized on the Profibus in a line structure. Thus there is the possibility to setup a very complex distributed system with the *REGARD Profibus-DP Gateway* that consist, e.g. of a PLC/DCS as a Profibus-DP master and a connection of up to 31 separate *REGARD Control-Systems* with up to 99 *REGARD channels* (theoretical upper limit).

There is also the possibility to integrate a *REGARD Control-System* with attached *REGARD Profibus-DP Gateway* into an already existing Profibus fieldbus network.

2.3. Note

The available operating manual to the *REGARD Profibus-DP Gateway* describes all substantial functions of the *gateway* and deals in particular with the installation, the configuration and the operation of the *gateway* with the *REGARD Control-System*.
If you should need further information about the universal field bus *gateway* UNIGATE®, please refer to the provided original user manual of the company Deutschmann Automation GmbH.

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3. Data transmission

By an attached Profibus-DP master the current status of the alarms A1, A2, A3 and Fault, Transmitter/Measuring head calibration, alarm inhibit, critical failure, timeout and the current gas concentration with sign, decimal places and measuring range exceeding of each channel card can be queried.
Additionally a Profibus-DP master is able to acknowledge alarms and faults of single or all channel cards as well as activating the command mode. If the command mode is activated automatically alarms will be inhibit.

The complete functionality of the *gateway* is linked to the Profibus-DP with 3 byte input data and 10 byte output data.

3.1. Inputdata

1. Byte	0**sss ssss**	*Card number* 1 to 99 for channel cards, 100 for *Master card*, 101 to 109 for *Extra-Master cards* or 127 for all *channel cards*, *Master-* and *Extra-Master cards*.
2. Byte	000**e lcqr**	**r** = 0/1 ⇒ reset flag „new status“. **q** = 0/1 ⇒ alarm acknowledge. **c** = 0/1 ⇒ command mode and alarm inhibit without lock (up to 10 minutes). **l** = 0/1 ⇒ command mode and alarm inhibit with lock (permanent). **e** = 0/1 ⇒ end command mode and alarm inhibit.
3. Byte*	0000 0**def**	**f** = 0/1 ⇒ maintenance password for command mode. **e** = 0/1 ⇒ configuration password for command mode. **d** = 0/1 ⇒ service password for command mode.

*** All flags in the 3rd byte can be set optional with flags „c“ and „l“ in the 2nd byte !**

Description:

1. Byte: Selection of the *REGARD channel card* by the *channel card number*, 1 up to max. 99, for querying of status and gas concentration (see Item 3.2 output data). In the 2nd and 3rd byte additional flags can be set, which will activate functions at the selected *channel card*.
Functions for the Master card shall be activated by selecting *card number* 100, for Extra-Master cards 101 to 109 and for all cards (channel cards, Master- and Extra-Master cards) by 127. This selection will only return the *card number* in the 1st byte in the output data. The flag „t“ for timeout in the 7st byte is only relevant for the Master card. All other flags in the output data will be set to „0“.

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2. Byte: Flag „r“ ⇒ Reset flag „n“, new status, in the 2nd byte of the output data.
Flag „q“ ⇒ Acknowledge alarms.
Flag „c“ ⇒ Activates the command mode and the alarm inhibit without lock.
The c*ards* will return into the normal operation mode automatically after 10 minutes. The *cards* can also be reset to normal operation mode before expiration of 10 minutes by setting flag „e“.
Optional the command mode can be activated with password for maintenance, configuration and service. To do this one of the flags „f“, „e“ or „d“ must be set. If the command mode is activated without password all configuration parameters of the *card* can only be read.
Flag „l“ ⇒ Activates the command mode and the alarm inhibit with lock.
The *cards* will not return into the normal operation mode automatically and must be reset by setting flag „e“.
Optional the command mode can be activated with password for maintenance, configuration and service. To do this one of the flags „f“, „e“ or „d“ must be set. If the command mode is activated without password all configuration parameters of the *cards* can only be read.
Flag „e“ ⇒ Exits the command mode and the alarm inhibit.

Note !
In the 2nd byte all flags only triggers functions, if they are changing from „0“ to „1“. If there is more then one flag set, only the flag with the highest priority will be considered where flag „r“ has the highest priority and flag „e“ has the lowest priority.
All flags in the 2nd byte of the input register will remain in this status and they must be reset to „0“ after the function is executed to activate a specific function again.

3. Byte: Flag „f“ ⇒ The command mode will be activated with maintenance password.
Flag „e“ ⇒ The command mode will be activated with configuration password.
Flag „d“ ⇒ The command mode will be activated with service password.

Note !
All flags in the 3rd byte are optional parameters for the activating of the command mode with flag „c“ and „l“ in the 2nd byte.
If there is more then one flag set, only the flag with the highest priority will be considered where flag „f“ has the highest priority and flag „d“ has the lowest priority.
All flags in the 3nd byte of the input register will remain in this status and they must be reset to „0“ after the function is executed to activate a specific function again.

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3.2. Output data

1. Byte	0**sss ssss**	*Card number* 1 to 99 for channel cards, 100 for Master card,101 to 109 for Extra-Master or 127 for all cards.
2. Byte	0000 000**n**	**n** = 0/1 ⇒ new status (A1, A2, A3, fault, Transmitter/Measuring head calibration, alarm inhibit, critical card fault, timeout).
3. Byte	0000 0**111**	**111** = 000/010 ⇒ Alarm1 (A1) off. **111** = 001/011/101/111 ⇒ Alarm 1 (A1) un-acknowledged. **111** = 100/110 ⇒ Alarm 1 (A1) acknowledged, but still activ.
4. Byte	0000 0**222**	**222** = 000/010 ⇒ Alarm 2 (A2) off. **222** = 001/011/101/111 ⇒ Alarm 2 (A2) un-acknowledged. **222** = 100/110 ⇒ Alarm 2 (A2) acknowledged, but still activ.
5. Byte	0000 0**333**	**333** = 000/010 ⇒ Alarm 3 (A3) off. **333** = 001/011/101/111 ⇒ Alarm 3 (A3) un-acknowledged. **333** = 100/110 ⇒ Alarm 3 (A3) acknowledged, but still activ.
6. Byte	0000 0**fff**	**fff** = 000/010 ⇒ Fault (FLT) off. **fff** = 001/011/101/111 ⇒ Fault (FLT) un-acknowledged. **fff** = 100/110 ⇒ Fault (FLT) acknowledged, but still activ.
7. Byte	0000 **tcih**	**h** = 0/1 ⇒ Transmitter-/Measuring head calibration (H-cal.). **i** = 0/1 ⇒ Alarm inhibit. **c** = 0/1 ⇒ critical failure. **t** = 0/1 ⇒ Timeout.
8. Byte*	00**mm mmmm**	00**mmmmmm**= High byte for gas concentration
9. Byte*	**nnnn nnnn**	**nnnnnnnn**= Low byte for gas concentration
10. Byte	0000 **sfdd**	**dd** = 00/01/10/11 ⇒ 0/1/2/3 decimal places. **f** = 0/1 ⇒ measuring range exceeded. **s** =0/1 ⇒ negative sign

*** Byte 8 and byte 9 can also read in by the Profibus-DP Master as „Word“ value !**

Description:

1. Byte: *Channel card number*, 1 to max. 99, for the available data in bytes 2 to 10 for status and gas concentration. With the *channel card number* it´s possible for the Profibus-DP master to determine whether the information of the selected *channel* is already present (valid), or whether the *gateway* still provides information for a *channel card* of a query taken place before (data validation). For card number 100 only the flag „t“ for timeout in the 7st byte is relevant. All other flags in the output data will be set to „0“.

2. Byte: Flag „n“ ⇒ The status in the byte 3 to 7 has changed against the last query of this *channel card*. If this flag is set, then all flags in byte 3 to byte 7 has to be evaluated again. This flag remains in it´s status until it´s reset with flag „r“ in the 2nd byte of the input data.

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3. Byte: Flags „111“ ⇒ With 3 flags the status of the 1st alarm (A1) will be shown. Depending on the alarm configuration of the *channel card* different flags will be set for an identical alarm status !

4. Byte: Flags „222“ ⇒ With 3 flags the status of the 2st alarm (A2) will be shown. Depending on the alarm configuration of the *channel card* different flags will be set for an identical alarm status !

5. Byte: Flags „333“ ⇒ With 3 flags the status of the 3st alarm (A3) will be shown. Depending on the alarm configuration of the *channel card* different flags will be set for an identical alarm status !

6. Byte: Flags „fff“ ⇒ With 3 flags the status of the fault (FLT) will be shown. Depending on the alarm configuration of the *channel card* different flags will be set for an identical alarm status !

7. Byte: Flag „h“ ⇒ The transmitter/measuring head connected to the *channel card* has turned into calibration mode.

Flag „i“ ⇒ The channel card is turned into the status alarm inhibit. Alarms will be inhibit, if the transmitter/measuring head connected to the *channel card* is turned into command mode or a fault alarm is triggered.

Flag „c“ ⇒ A critical failure has occurred at the *channel card*. For critical failures also a fault (FLT) occures.

Flag „t“ ⇒ A timeout has occured for the selected *channel or Master card*. No current data for status and gas concentration is available, because the *channel card* is not connected to the *control system* or the card is not configurated correctly. With *Master cards* the card is not connected to the *control system* or the card is not configurated correctly.

8. Byte: High-byte for measuring value of the gas concentration.

9. Byte: Low-byte for measuring value of the gas concentration.

Note !
Byte 8 and byte 9 can also read in by the Profibus-DP Master as „Word“ value !

10. Byte: Flags „dd“ ⇒ Shows the decimal places for the measurement of the gas concentration.

Flag „f“ ⇒ Measuring range exceded has occured.

Flag „s“ ⇒ The measurement of the gas concentration has a negative sign.

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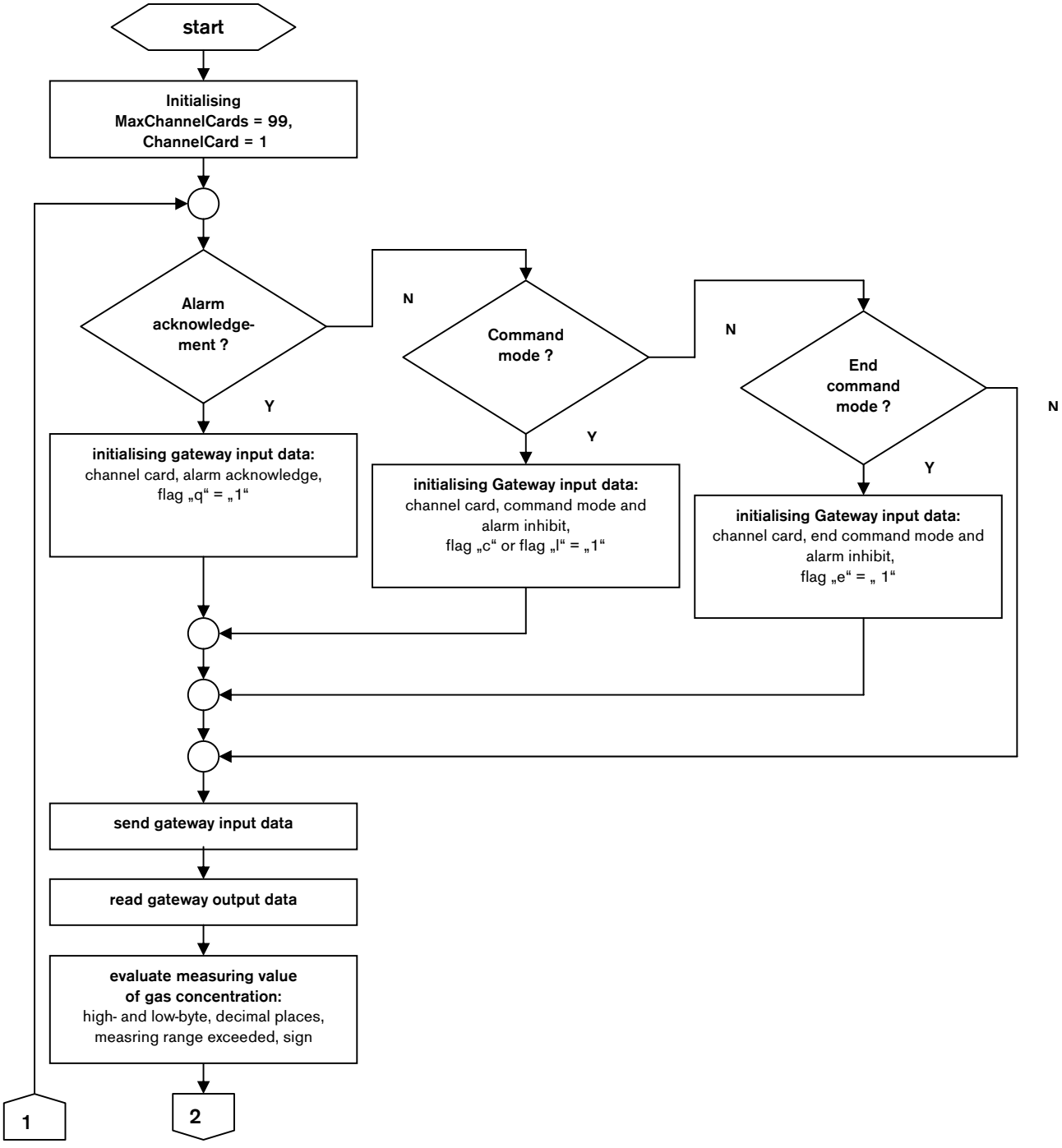
3.2. Data exchange

The following flowchart shows in a simple form the cyclically data exchange between a Profibus-DP Master and the *REGARD Profibus-DP Gateway*. The activation of functions for all *channel cards*, *Master cards* or *Extra-Master cards* is not included in this flowchart.



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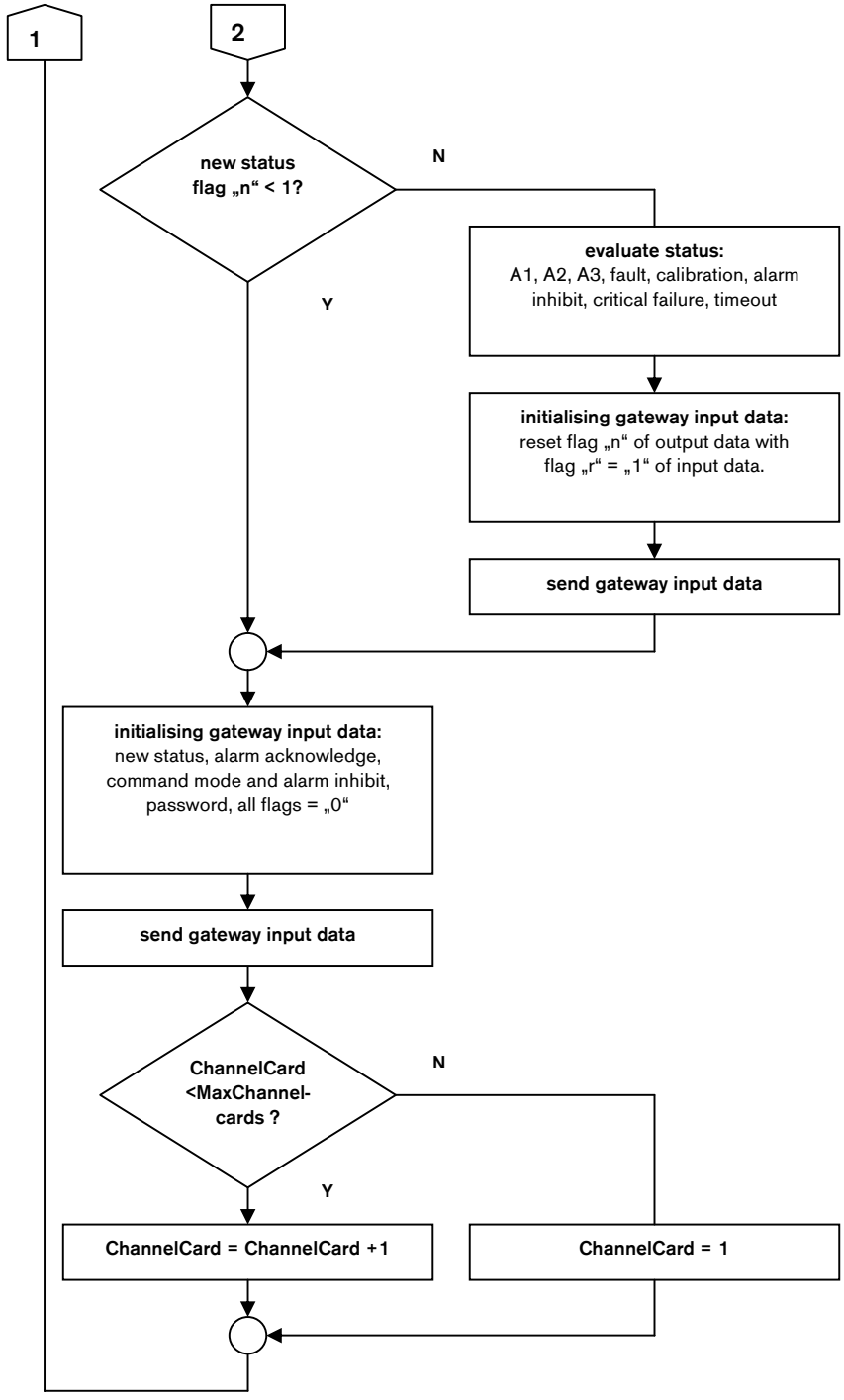
1
2
new status flag „n“ < 1?
N
Y
evaluate status: A1, A2, A3, fault, calibration, alarm inhibit, critical failure, timeout
initialising gateway input data: reset flag „n“ of output data with flag „r“ = „1“ of input data.
send gateway input data
initialising gateway input data: new status, alarm acknowledge, command mode and alarm inhibit, password, all flags = „0“
send gateway input data
ChannelCard <MaxChannel-cards ?
N
Y
ChannelCard = ChannelCard +1
ChannelCard = 1

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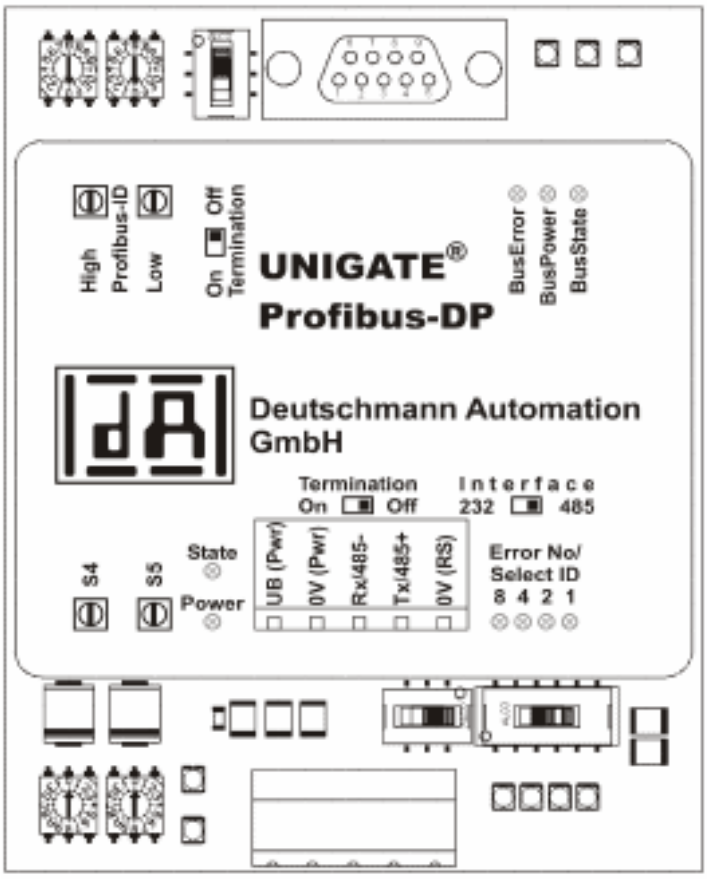
4. Installation



Picture 1

4.1. Control cabinet installation

The *gateway* has been developed for use in a control cabinet use, IP20, and therefore it must be mounted on a standard top hat-rail (deep top hat-rail according to EN 50022).

- Engage the *gateway* modul from the top in the top-hat rail and swivel it down until the module engages in position.
- Above and below the *gateway* modul must be at least 5 cm clearance for heat dissipation.

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4.2. Equipotential bonding connection

- Connect the standard top hat-rail (deep top hat-rail according to EN 50022) with as low impedance as possible to the equipotential bonding strip of the control cabinet (see Item 4.7/Picture 2). Use a flexible earthing wire with a cross-section of at least 10mm^2 for this.
- Fit an earthing terminal to the top-hat rail directly next to the *gateway*-module. The earthing terminal automatically establishes an electrical connection to the top-hat rail.
- The gateway connection to the equipotential bonding is automatically established via the integrated earthing connection in the left part of the device when it is put on the DIN-rail.

4.3. Power supply

The *gateway* operates with a supply voltage of 10,8V–30V DC (nominal 24V DC). The connection of the supply voltage is routed via the 5-pin screw-type plug connector (see also Item 4.4 and Item 4.7 /Picture 2).

4.4. REGARD Control-System connection

The serial interface connection of the *REGARD Profibus-DP Gateway* to the internal *REGARD system bus* is routed via the 5-pin screw-type plug connector (see also Item 4.7/Picture 2). Use a flexible shielded cable with at least 3 wires (for example LiYCY 3x0,25) for this.

Pin assignment: 5-pin screw-type plug connector

Pin No.	REGARD Profibus-DP Gateway	Function	REGARD Control-System
1	Power supply 24V/DC	Power supply	Power supply 24V/DC
2	Power supply 0V	Power supply	Power supply 0V
3	RX / RS485- (RS485 B)	Receive signal	Internal Bus RS485 B
4	TX / RS485+ (RS485 A)	Transmit signal	Internal Bus RS485 A
5	GND (connection to Pin No. 2)	Reference for Pin 3 + 4	————————

The cable shield has to be connected to the earthing connection terminal (equipotential bonding) next to the *gateway* module (see also Item 4.7/Picture 2).

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4.5. Profibus-DP connection

The connection of the *REGARD Profibus-DP Gateway* to the Profibus-DP is routed via the 9-pin Sub-D socket (see also Item 4.7/Picture 2). Use only cable which is certified for Profibus-DP applications.

Pin assignment: 9pin Sub-D socket

Pin No.	Name	Function
1*	Shield*	Shield*
2	-	-
3	B	Non-inverting input/output signal from Profibus
4	-	-
5	M5	DGND – data reference potential
6	P5	5V supply voltage
7	-	-
8	A	Inverting input/output signal from Profibus
9	-	-

* The shield of the Profibus cable is connected to the equipotential bonding system via an RC-network. This guarantees higher interference immunity of the *gateway* module since the cable shield current which may be up to a few Amperes owing to potential differences between two bus users is not discharged via the device.

4.6. Shield connection

The shield signal for the electronic circuitry is connected to the DIN-rail via the integrated earthing connection in the left part of the device.
The shield of the Profibus cable must be directly linked up to the 9-pin Sub-D socket connector (see also Item 4.5) and is connected to the equipotential bonding system via an RC-network. This guarantees higher interference immunity of the *gateway* module since the cable shield current which may be up to a few Amperes owing to potential differences between two bus users is not discharged via the device.

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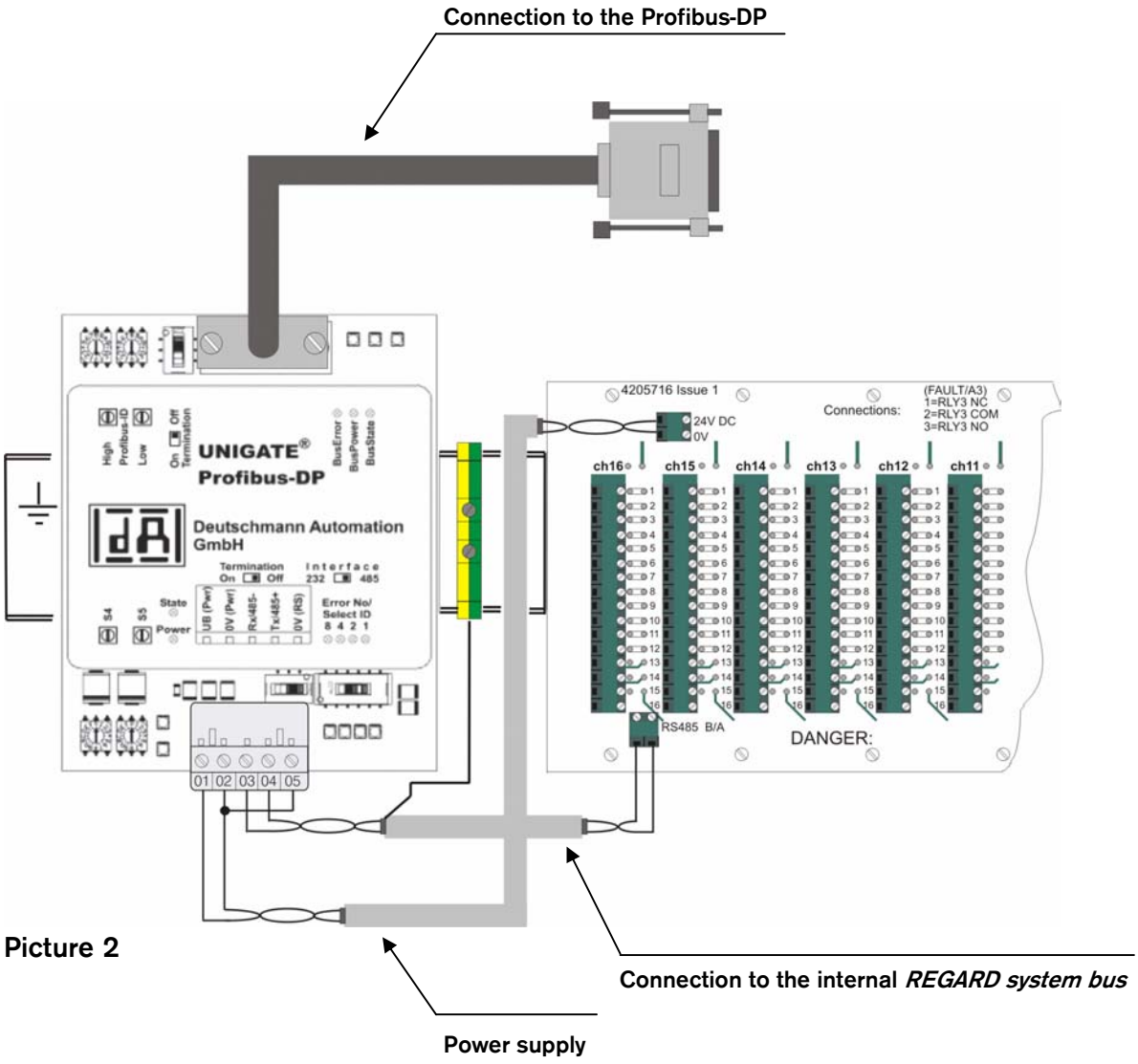
4.7. Connection diagram



Picture 2

Note !
Please make sure, that the connection between the *gateway* and the *REGARD Control-System* is correct, otherwise a communication error occures within the *Control-System* !
***Gateway* RS485 A, Pin No. 4 -> *REGARD system bus*, RS485 A.**
***Gateway* RS485 B, Pin No. 3 -> *REGARD system bus*, RS485 B.**

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5. Configuration

5.1. Profibus-DP

The *gateway* features 3 switches to set the Profibus-ID and the Bus-Termination:

Rotary coding switch, Profibus-ID High	Profibus-DP ID (High byte)
Rotary coding switch, Profibus-ID Low	Profibus-DP ID (Low byte)
Slide switch “Termination“	Switchable Profibus-DP termination resistor

5.1.1. Rotary coding switch “Profibus-ID High und Low“

These two switches are used to set the Profibus-ID (00..7D) of the *gateways* in hexadecimal notation. A conversion table from decimal to hexadecimal can be found in the appendix. This value is read only once when the *gateway* is activated and cannot be changed via the Profibus. In case of changing the position of the rotary coding switches the *gateway* must be switched off and switched back on again.

5.1.2. Slide switch “Termination Profibus“

If the *gateway* is operating as the first or last physical device in the Profibus-DP, there must be a bus termination at the *gateway*. In order to do this, either a bus terminating resistor must be activated in the connector or the resistor (220Ω) integrated in the *gateway* must be activated. In order to do this, move the slide switch to position „ON“. In all other cases, the slide switch must remain in the position „OFF“. For further information on the subject of bus termination please refer to the general Profibus literature.

5.2. RS232/RS485 interface

The *gateway* features 4 switches to set the RS232/RS485 interface, the RS485-ID and the Bus-Termination:

Rotary coding switch S4	RS485-ID (High byte)
Rotary coding switch S5	RS485-ID (Low byte)
Slide switch “Interface“	Switch to select RS485 or RS232 interface
Slide switch “Termination“	Switchable RS485 termination resistor

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5.2.1. Rotary coding switch “S4 + S5 (RS485-ID)“

These two switches are used to set the RS485-ID of the *gateway* in hexadecimal notation. Operating the *gateway* with the *REGARD Control-System* switch „S4“ and „S5“ must be set to position „0“.
In case of maintenance (see also Item 5.4) the *gateway* has to be brought to the configuration mode by setting the switches „S4“ and „S5“ to the position „F“. The setting is read in only once when the *gateway* is activated. In case of changing the position of the rotary coding switches the *gateway* must be switched off and switched on again.

5.2.2. Slide switch “Interface (RS485/RS232)“

This switch is used to select whether the *gateway* is running with the *REGARD Control-System* or in the configuration mode in case of maintenance (see also Item 5.4). Running the *gateway* with the *REGARD Control-System* the switch „Interface“ must be set to position „RS485“.
For running the configuration mode to position „RS232“.

5.2.3. Slide switch “Termination (RS485 ON/OFF)“

If the *gateway* is operated as the first or last physical device in the internal RS485 bus of the *REGARD-Control-System*, there must be a bus termination at this *gateway*. In order to do this, either a bus terminating resistor in the connector or the resistor integrated in the *gateway* (150Ω) must be activated. To activate the integrated resistor the slide switch „Termination“ must be set to position „ON“.
In all other cases, the slide switch must remain in position „OFF“. For further information on the subject of bus termination please refer to the general RS485 literature.
If the integrated resistor is used, please consider that this automatically activates a pull-down resistor (390Ω) to ground and a pull-up resistor (390Ω) to VCC.

5.3. REGARD Control-System

On all cards of the *REGARD Control-System* the communication checksum has to be configured to „CRC“. For further information on this subject please refer to the user documentation for the *REGARD Control-System*.

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5.4. Select REGARD protocol

On delivery the protocol software (see also Item 2.2) for the *REGARD Control-System*, adapted by the company Deutschmann Automation GmbH, is already loaded into the *REGARD Profibus-DP Gateway* and the parameters for the serial interface to the *REGARD Control-System* are already preconfigured (see also Item 5.4.2).

Note !
A configuration by using the software Wingate® which comes as a standard accessory is not required and only in case of maintenace or service it´s necessary to do this !

In case of maintenance or service the *gateway* has to be brought to the configuration mode. For this the switches S4 and S5 have to be set to position „F“ and the switch „Interface“ has to be set to position „RS232“. Next a connection to the PC serial port has to be established and the *gateway* has to be started once more. The program Wingate® automatically selects the interface parameters correctly. For the operation of Wingate® please take a look at the Wingate® Online help.

5.4.1. Profibus-DP configuration parameter

The configuration parameter of the *gateway* for the Profibus-DP master connection can be load via the GSD file which comes on disk as a standard accessory.

- Configuration data: in acc. with GSD file, module „DRAEGER (REGARD Vers. 20) 3E/10A“ „DRAEGER (REGARD Vers. 21) 3E/10A“, starting with serial number 28540259
- Diagnostic data: max. 8 byte
- Baud rate: automatic detection up to 12 MBaud
- Sync: supported
- Freeze: supported
- Ident. No.:0x2079

5.4.2. Serial interface parameter RS232/RS485

The following parameters for the serial interface to the *REGARD Control-System* are already preconfigured and only in case of maintenance or service the parameters must be reconfigured by using the software Wingate® which comes on disk as a standard accessory (see Item 5.4).

- Start bit: 1
- Data bits: 8
- Stop bit: 1
- Parity: None
- Baud rate: 4800 Baud

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6.1. Visual indication

The *gateway* features 9 LEDs with the following significance:

LED Bus Error	red	Profibus error
LED Bus Power	green	Profibus supply voltage
LED Bus State	red/green	Interface status, Profibus DP
LED Power	green	RS485/RS232 supply voltage
LED State	red/green	Interface status, RS485/RS232
LED Error No / Select ID	yellow	Binary display of the connection to the REGARD channel number (address) /error number

Note !
In the configuration mode these displays are not valid and only meant for internal use.

6.1. LED “Bus Error“

These LED is activated directly by the Profibus ASIC and signals that the Profibus is not in “DATA EXCHANGE” status.

6.2. LED “Bus Power“

This LED is directly connected to the electrically isolated supply voltage of the Profibus end.

6.3. LED “Bus State“

Lights green	Profibus in Data Exchange status
Flashes green	*Gateway* waiting for Profibus configuration data
Flashes green/red	*Gateway* waiting for Profibus parameter data
Lights red	General Profibus error

6.4. LED “Power“

This LED is directly connected to the (optionally also electrically isolated) supply voltage of the RS485/RS232 end.

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6.5. LED “State“

Lights green	Data exchange active via RS485/RS232
Flashes green	RS485/RS232 ok, but no permanent data exchange
Flashes green/red	No data exchange since switching on
Lights red	General *gateway* error (see LED’s Error No.)
Flashes red	*Gateway* is in configuration mode

6.6. LED “Error No. / Select ID“

If these 4 LEDs flash and LED “State“ simultaneously lights red, the error number is displayed in binary notation (conversion table, see appendix) in accordance with the table of Chapter "Error handling". Otherwise, the *card number* with which communication is currently operating via the RS232/RS485 interface is displayed also in binary notation.

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7. Error handling

If the *gateway* modul detects an error, the error is signalled by the red lighting “State“ LED and simultaneously the error number being indicated by means of “Error No.“ LEDs as shown in the table below. In addition, this error number is transfered as an external diagnostic byte via the Profibus to the Master. A distinction can be made between two error categories:
Serious errors (1-5): In this case, the *gateway* must be switched off and switched back on again. If the error occurs again, the *gateway* modul must be exchanged and returned for repair.
Warnings (6-15): These warnings are displayed for one minute simply for information purpose and are then automatically reset. If such warnings accure frequently, please inform the DrägerService.

In the configuration mode these displays are not valid and only meant for internal use.

LED8	LED4	LED2	LED1	Error no. resp. ID	Error descrition
0	0	0	0	0	Reserved
0	0	0	1	1	Initialisation error of the RS485/RS232 interface
0	0	1	0	2	EEROM error
0	0	1	1	3	Stack error
0	1	0	0	4	Hardware fault of the fieldbus ASIC
0	1	0	1	5	Configuration error of the *gateways* (unknown protocol)
0	1	1	0	6	Reserved
0	1	1	1	7	RS485/RS232 transmit buffer overflow
1	0	0	0	8	RS485/RS232 receive buffers overflow
1	0	0	1	9	Timeout on reception RS485/RS232 interface
1	0	1	0	10	Transmit error of the RS485/RS232 interface
1	0	1	1	11	Receive error of the RS485/RS232 interface
1	1	0	0	12	Adressing error of the RS485/RS232 interface
1	1	0	1	13	Configuration error by the Profibus-Master
1	1	1	0	14	General error of the RS485/RS232 interface
1	1	1	1	15	Internal error

Table 1: Error handling

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8. Technical data

8.1. Device data

Device data:	
Location:	Control cabinet, Top-hat rail mounting (35mm)
External power supply	10,8 to 30V DC (24V DC nominal)
Current consumption	at 24V DC: typ. 120 mA, max. 150 mA ; at 10,8V DC: typ. 350 mA
Power supply at the Profibus interface	5V DC / max. 50 mA
Protection	Reverse voltage protection, short circuit protection, overload protection
Environment conditions	
Temperature:	0 bis +60°C with forced convection, 0 bis +40°C without forced convection
Atmospheric pressure:	795 bis 1080 hPa during operation, 660 bis 1080 hPa during storage and transport
Relative humidity:	5 % bis 80 % , no condensation, no corrosive atmosphere
Enclosure	IP 20
Housing size	90 x 127 x 55 mm (WxHxD) / 5 x 7 x 6“ (WxHxD)
Weight	0,3 Kg
Approvals	CE mark: elektromagnetic compatibility, Profibus certification

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8.2. Interface data

Interface data:		
Interface designation	**Profibus-DP**	**REGARD**
Physical interface	RS-485	RS-485
Standard	EIA-Standard	EIA-Standard
Transmission mode	Symmetrical Asynchronous serial half-duplex -> Difference signal	Symmetrical Asynchronous Serial half-duplex -> Difference signal
Transmission method	Master / Slave	Master / Slave
Number of users :	32 Transmitters 32 Receivers	1 *REGARD Control-System* with *REGARD Master* card and up to 99 *REGARD channels*.
Bus topology	Line	Line
Data rate	Max.: 12 MBits/s Standard: 9,6 kBits/s, 19,6 kBits/s, 93,75 kBits/s,187,5 kBits/s, 500 kBits/s,1,5 MBits/s, 3 MBits/s, 6 MBits/s,12 MBits/s	4,8 kBits/s
Cable length	Max.: 1200m Baud rate-dependent: 93,75 kBd -> 1200m, 500 kBd -> 500m, > 1,5 MBd -> 100m	1200m

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9. Appendix

9.1. REGARD Control-System connection

Pin assignment: 5-pin screw-type plug connector

Pin No.	REGARD Profibus-DP Gateway	Function	REGARD Control-System
1	Power supply 24V/DC	Power supply	Power supply 24V/DC
2	Power supply 0V	Power supply	Power supply 0V
3	RX / RS485- (RS485 B)	Receive signal	Internal Bus RS485 B
4	TX / RS485+ (RS485 A)	Transmit signal	Internal Bus RS485 A
5	GND (connection to Pin No. 2)	Reference for Pin 3 + 4	————————

9.2. Profibus-DP connection

Pin assignment: 9-pin Sub-D socket connector

Pin No.	Name	Function
1*	Shield*	Schield*
2	-	-
3	B	Non-inverting input/output signal from Profibus
4	-	-
5	M5	DGND – data reference potential
6	P5	5V supply voltage
7	-	-
8	A	Inverting input/output signal from Profibus
9	-	-

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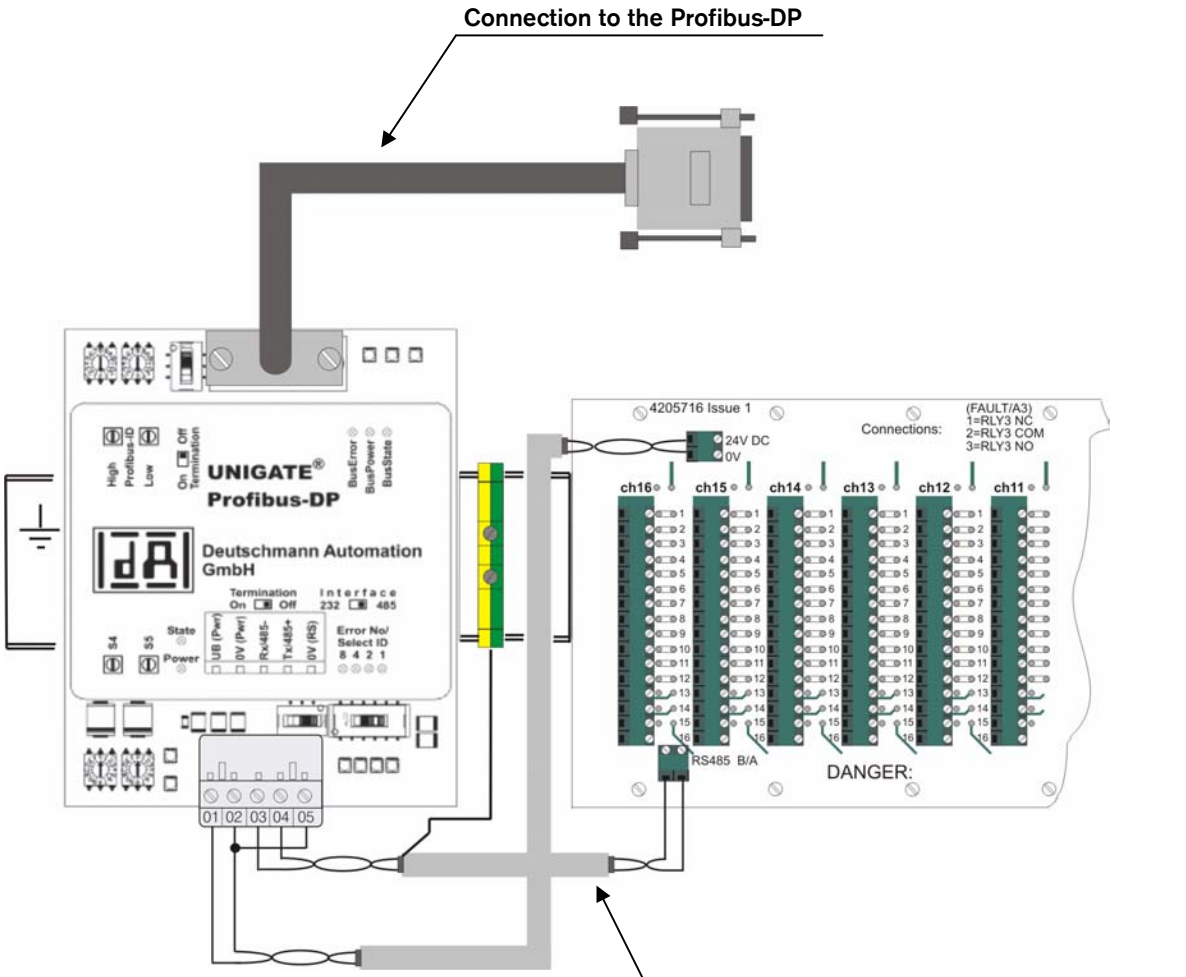
9.3. Connection diagram



Picture 2

Note !
Please make sure, that the connection between the *gateway* and the REGARD Control-System is correct, otherwise a communication error accures within the Control-System !
***Gateway* RS485 A, Pin No. 4 -> *REGARD system bus*, RS485 A.**
***Gateway* RS485 B, Pin No. 3 -> *REGARD system bus*, RS485 B.**

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9.4. Hexadecimal table

Hex	Decimal	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
A	10	1010
B	11	1011
C	12	1100
D	13	1101
E	14	1110
F	15	1111

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